



EUI WORKING PAPERS IN ECONOMICS

EUI Working Paper ECO No. 94/2

**Can Forecasters' Motives
Explain Rejection of the Rational
Expectations Hypothesis?**

TILMAN EHRBECK
and
ROBERT WALDMANN

NP
330
EUR

European University Institute, Florence

European University Library



3 0001 0015 4960 1

Please note

As from January 1990 the EUI Working Paper Series is divided into six sub-series, each sub-series is numbered individually (e.g. EUI Working Paper LAW No. 90/1).

EUROPEAN UNIVERSITY INSTITUTE, FLORENCE

ECONOMICS DEPARTMENT

EUI Working Paper ECO No. 94/2

**Can Forecasters' Motives
Explain Rejection of the Rational
Expectations Hypothesis?**

**TILMAN EHRBECK
and
ROBERT WALDMANN**

BADIA FIESOLANA, SAN DOMENICO (FI)

All rights reserved.
No part of this paper may be reproduced in any form
without permission of the authors.

© Tilman Ehrbeck and Robert Waldmann
Printed in Italy in January 1994
European University Institute
Badia Fiesolana
I – 50016 San Domenico (FI)
Italy

Can Forecasters' Motives Explain Rejection of the Rational Expectations Hypothesis?

Tilman Ehrbeck and Robert Waldmann*
European University Institute

December 1993

Abstract

The predictions of the rational expectations hypothesis have been rejected by analysis of surveys of expectations. These results have left many economists unconvinced, partly because of econometric problems, but largely because the rational expectations hypothesis is tested along with the auxiliary hypothesis that survey participants aim to minimize squared forecast errors. It is often argued that a careful analysis of survey participants true aims would reconcile their predictions with the rational expectations hypothesis. This paper presents a model in which fully rational agents choose to make forecasts different from the conditional expected value of the variable forecasted. This model is interesting because it implies that it is rational to extrapolate short run trends in forecasts. More importantly, the model yields simple predictions which are tested using predictions of interest rates from the North Holland Economic Forecasts publication. The predictions of the rational expectations hypothesis with a quadratic loss function and with our model are both rejected. The failure of an effort to reconcile forecastable errors with the rational expectations hypothesis strengthens the evidence against the hypothesis.

*We would like to thank Gerhard Orousel, Danny Quah and Ailsa Roell for helpful comments. The usual caveat applies

1 Introduction

The rational expectations hypothesis as formulated by Muth implies that agents minimize the expected value of losses due to forecast errors. With the common auxiliary hypothesis that these losses are quadratic in the forecast errors, it yields the prediction that forecast errors are uncorrelated with information available to the forecaster. One apparently direct and appealing approach to testing this hypothesis is to interpret the responses to surveys of expectations as such forecasts. It has been repeatedly found that survey forecast errors are correlated with available information (Carlson [1977], Ehrbeck [1992], Figlewski and Wachtel [1981], Ito [1990], Pearce [1979], Pesando [1975]).

These results have not convinced most economists that the hypothesis is false. Some report unconvincing conclusions because of statistical problems, however the conclusion remains after correction of these problems. The strong assumptions about the aims of the survey participants are more problematic. Among other things, the assumption of a simple quadratic loss function is based on the dubious analogy between speech and action. In other words, on the assumption that participants accurately report the expectations they use when acting.

Rational agents may choose differently, if honesty is not always the best policy. We present a model in which a rational professional forecaster chooses forecasts in order to convince his clients that his forecast errors are small. Needless to say, this provides an incentive to report forecasts close to the forecasters belief about the expected value of the variable forecasted. If the forecaster makes repeated forecasts about the same event, it also makes it undesirable to admit that earlier forecasts were wrong. A forecaster who continually changes his prediction, convinces his client that he has poor information. This implies rational stubbornness where the forecasters adjust their public forecasts too little in response to new information.

This yields the simple prediction that forecast errors are negatively correlated with changes in forecasts. It thus implies that rational clients extrapolate changes in forecasts. In Nash equilibrium, clients do not make systematic forecast errors. The efforts of professional forecaster to convince their clients that they have precise information might reduce the efficiency of communication, but it does not cause systematic confusion. This is a common pattern in models of communication. The revelation principle can be interpreted as implying that the outcome is the same as it would be if agents provided a more or less precise

but always honest report of their beliefs. If the actual signal is interpreted as part of the outcome many equilibria called, e.g. English and German, are possible. In our example a change of a stated forecast “means” that the forecasters’ beliefs about the conditional mean of the variable forecasted have changed by a greater amount.

An even simpler example of a game in which rational agents say things which sound irrational, are statements about the accuracy of one’s predictions. If there is any asymmetric information about the quality of information, it is obviously rational to overstate the precision of one’s forecast. Indeed survey participants consistently report subjective overconfidence (Alpert and Raiffa [1959], Einhorn and Hogarth [1978], Lichtenstein, Fischhoff and Phillips [1982], Tversky and Kahneman [1971]). Alpert and Raiffa report that when asked for e.g. a 90% confidence interval agents give an interval which contains the true value only 50% of the time.

This could clearly result from a compromise between accurately reporting one’s modesty and not wishing to give the impression that one has much to be modest about. The choices of experimental subjects facing risk show excessive fear of low probability extreme events (Tversky and Kahneman [1974]). The two anomalies might explain each other. If Alpert and Raiffa’s survey participants told Tversky and Kahneman’s experimental subjects about the probabilities, accurate communications might be achieved. When told that the probability that the payoff will be in an interval is 99% the experimental subjects would correctly conclude that the true probability was 90% and act accordingly. Of course Tversky and Kahneman were not overstating their knowledge about the behavior of their random number generator, so their subjects’ actions can’t be rationalized by this argument. The argument is that they made a mistake based on a false analogy between the meaning of, say, the phrase 10% in everyday English and its meaning in probability textbooks and Kahneman and Tversky’s laboratory.

One interesting application of the model of rational stubbornness requires us to relax the strong rationality assumption as in the simpler example of rational boasting above. If the disillusioned clients of professional forecasters attempt to make their own forecasts based on the market price, they might conceivably rely on the following faulty analogy between asset prices and stated forecasts. “I know that people are reluctant to admit earlier forecasts were wrong and that I should extrapolate changes in forecasts. The price of an asset is the market’s forecast of its value. Therefore to predict the value of an asset I should extrapolate changes in its price.”

This reasoning would be faulty because market participants put their money where their mouth is and are therefore likely to base their actions on their true beliefs. Such faulty reasoning could explain survey and experimental results which show a tendency to overestimate future asset prices when the asset has recently increased in value (Case and Shiller [1988], Frankel and Froot [1988], Andreassen and Kraus 1988, Smith Suchanek and Williams [1988]). This particular bias is very important since it can cause destabilizing speculation in particular since fully rational investors find it more profitable to ride bubbles caused by extrapolative expectations than to nip the tulips in the bud. For explanation of extrapolation of price changes to be true it must be rational to extrapolate changes in the stated forecasts of professional forecasters.

The implications of our model are then tested empirically with a small panel data set of forecasts of U.S. interest rates. The forecasters in this particular data set do not revise their stated predictions too little as implied by the theory. To the contrary, they over-adjust their public announcements. Our attempt to save the rationality postulate in expectations by providing a rationale for apparently systematic mistakes in stated predictions is thus refuted.

2 A Model of Advice

Let there be two agents in the following, simple model of advice – an advisor and a client. The advisors supplies the client with predictions of the value of a random variable. The client uses these stated predictions to form his own forecast of the value of the variable. The client also attempts to determine the quality of the advisor's information analyzing the stated forecasts and the realized value of the predicted variable. If the client concludes that the advisor has poor information, he terminates the relationship and looks for a new advisor. The advisor attempts to convince the client that he has high quality information. For simplicity, we assume a cynical advisor who has no other aim.

To be more specific, assume that the client wishes to learn the expected value of a random variable y but has no information on it. He asks an advisor to predict it for him. There are various advisors indexed by i . The advisor i receives a signal s_1 in period one and s_2 in period two. Each signal is an unbiased predictor of y and, in particular:

$$\begin{aligned}s_1 &= y + \epsilon_1 \\ s_2 &= y + \epsilon_2\end{aligned}\tag{1}$$

with:

$$\epsilon_1, \epsilon_2 \sim N(0, \sigma_i^2)$$

The expected value of y conditional on s_1 is s_1 and the expected value of y conditional on s_1 and s_2 is

$$\frac{s_1 + s_2}{2}.$$

In period one, the advisor tells the client that he expected value of y is f_1 and in period two the advisor tells the client that the expected value is f_2 . These predictions may or may not be equal to the advisors best predictions based on his information. In fact, the advisor will have an incentive to report a prediction f_2 which is not equal to

$$\frac{s_1 + s_2}{2}.$$

In each period, the client attempts to correct for any bias in the stated predictions f_1 and f_2 and to forecast y . The client also attempts to estimate σ_i^2 – the measure of the quality of advice. For notational convenience, we suppress the subscript i in the remainder of this section. If the estimated σ^2 is high, the client terminates the relationship. For simplicity, we assume that the probability of termination is proportional to σ^2 . If the client does not terminate the relationship, the game is repeated with new values of y , s_1 and s_2 .

First, we ask whether honesty is a Nash equilibrium of the repeated game, that is, is there a Nash equilibrium in which the advisor reports $f_1 = s_1$ and

$$f_2 = \frac{s_1 + s_2}{2}$$

and in which the client knows that he does so ? The answer is no. If the client believes that the advisor is honest, the advisor has an incentive to tell him

$$f_2 \neq \frac{s_1 + s_2}{2}.$$

To see this, consider alternative, not so honest strategies in which the advisor reports $f_1 = s_1$ and $f_2 = (1 - a)s_1 + as_2$. If the client assumes $a = \frac{1}{2}$, the advisor benefits from using $a < \frac{1}{2}$. This results from the way the client tries to estimate σ^2 .

In the first period, the client has no information on σ^2 . In the second period, the client who believes that $a = \frac{1}{2}$ can use the following formula to deduce that quality of advice from the stated predictions:

$$\begin{aligned}
 \hat{\sigma}^2 &= 2(f_2 - f_1)^2 \\
 &= 2\left(\frac{\epsilon_2 - \epsilon_1}{2}\right)^2 \\
 &= \frac{1}{2}(\epsilon_2^2 + \epsilon_1^2 - 2\epsilon_2\epsilon_1)
 \end{aligned} \tag{2}$$

The expected value of expression (2) is $E(\hat{\sigma}^2) = \sigma^2$ as desired.¹

If, however, the advisor uses the alternative, not so honest strategies, equation (2) changes to:

$$\begin{aligned}
 \hat{\sigma}^2 &= 2(f_2 - f_1)^2 \\
 &= 2a^2(\epsilon_2^2 + \epsilon_1^2 - 2\epsilon_2\epsilon_1)
 \end{aligned} \tag{3}$$

The expected value of expression (3) is $E(\hat{\sigma}^2) = 4a^2\sigma^2$. By choosing $a < \frac{1}{2}$, the unscrupulous advisor can trick the client into underestimating σ^2 , i.e., into overestimating the quality of the advisor's information. By using $a < \frac{1}{2}$, the advisor is refusing to admit that his first signal was different from his current best estimate of y . If the client assumes that the advisor is not doing this, he will be tricked into believing that s_1 was closer to y than it was.

¹Note $\hat{\sigma}^2$ is not only unbiased under the assumption that $a = \frac{1}{2}$, but also achieves the Cramer-Rao lower bound under the same assumption. This means that $\hat{\sigma}^2$ is a complete sufficient statistic and therefore a sufficient statistic. This means that the likelihood of σ^2 is a function of σ^2 and $\hat{\sigma}^2$ and so if the client, e.g. uses Bayesian updating of a prior on σ^2 to decide whether to go look for a new advisor, the optimal approach is to first calculate $\hat{\sigma}^2$. Note even if the client is only interested in $\text{var}(f_2 - y)$ that this is a function of σ^2 and $\frac{\hat{\sigma}^2}{2}$ is the best unbiased estimate of $\text{var}(f_2 - y)$. It is at least as good as any other and strictly better than, e.g. the sample average of past $(f_2 - y)^2$.

This trick is not costly to the advisor in period three when the client learns the true value of y . In fact, the trusting client will continue to overestimate the quality of the information of the unscrupulous advisor who refuses to admit errors. In the third period, the client can extract estimates of the errors in the signals s_1 and s_2 , using the assumption that $f_1 = y + \epsilon_1$ and that $f_2 = y + \frac{\epsilon_1 + \epsilon_2}{2}$. Assuming $a = \frac{1}{2}$, he calculates:

$$\begin{aligned}\hat{\sigma}^2 &= \frac{(f_1 - y)^2}{2} + \frac{(2f_2 - f_1 - y)^2}{2} \\ &= \frac{1}{2}(\epsilon_1^2 + \epsilon_2^2)\end{aligned}\quad (4)$$

The expected value of expression (4) is again $E(\hat{\sigma}^2) = \sigma^2$. If, however, the advisor uses the alternative, not so honest strategies, equation (4) changes to:

$$\hat{\sigma}^2 = \frac{\epsilon_1^2}{2} + \frac{[(1 - 2a)\epsilon_1 + 2a\epsilon_2]^2}{2}\quad (5)$$

The expected value of expression (5) is:

$$\begin{aligned}E(\hat{\sigma}^2) &= \frac{\sigma^2}{2} + \frac{[(1 - 2a)^2 + 4a^2] \sigma^2}{2} \\ &= (4a^2 - 2a + 1)\sigma^2\end{aligned}\quad (6)$$

which is increasing in a .

If the client believes that the advisor is using $a = \frac{1}{2}$, the advisor has an incentive to use $a < \frac{1}{2}$, that is, to revise his first stated prediction by less than the new information warrants. By refusing to admit that his first prediction was inaccurate, the advisor can trick such a naive client into believing that has better information than he does. In this model, honesty is not the best policy. It is not a Nash equilibrium of the advising game to give advice which, if taken literally, is optimal.

Unfortunately, the game has no static pure strategy equilibrium in which all advisors follow the same strategy. For any positive A , the advisor gains by using $a < A$. The argument is the same as used above.

For a static pure strategy Nash equilibrium to exist, it is necessary for different advisors to have a different willingness to admit they were wrong. It

is easier to discuss this if only two types of advisors are considered – advisors with low σ , say $\sigma = 1$, and advisors with a high σ , say greater than 1. If advisors with poor signals use weighting coefficients a lower than advisors with good signals, then refusing to admit one was wrong is a sign that one had poor information.

The client can attempt to estimate a by regressing the second forecast error $(f_2 - y)$ on the change in forecasts $(f_2 - f_1)$. If the advisor is being frank and f_2 is the optimal forecast based on s_1 and s_2 , the expected value of this regression coefficient is zero².

To see this, consider the OLS estimate of the regression coefficient:

$$\hat{\beta}_{OLS} = \frac{\sum_{t=1}^T \left(\frac{\epsilon_{t,2}^2 - \epsilon_{t,1}^2}{4} \right)}{\sum_{t=1}^T \left(\frac{\epsilon_{t,2} - \epsilon_{t,1}}{2} \right)^2} \quad (7)$$

If, however, the advisor uses the alternative, not so honest strategies, expression (7) changes to:

$$\hat{\beta}_{OLS} = \frac{\sum_{t=1}^T [a(\epsilon_{t,2} - \epsilon_{t,1}) [(1-a)\epsilon_{t,1} + a\epsilon_{t,2}]]}{\sum_{t=1}^T [a(\epsilon_{t,2} - \epsilon_{t,1})]^2} \quad (8)$$

The expected value of equation (8) is $E(\hat{\beta}_{OLS}) = 1 - \frac{1}{2a}$. If $a = \frac{1}{2}$, the expected value is zero, as above. If $a < \frac{1}{2}$, the expected value of $E(\hat{\beta}) < 0$. Forecast error and change in the stated predictions are negatively correlated, that is, when, say, the change goes up, this has a negative effect on the forecast error, because the change should have been bigger if the advisor were honest.

In a game with more than one type of advisor, the possibility of inference about a changes the incentive structure. If advisors with poor information use a lower a than advisors with good information, correlation between the change and the final forecast errors is a negative signal about their ability. This implies that it is not always optimal for the advisor to use a lower a than the client believes he is using.

²Bernheim [1989] notes that this is a test for rational expectations in survey data

3 A Simpler Model of Advice

In this section the assumption about the distribution of the disturbances in the signals is changed. It is assumed that the i^{th} advisor receives signals:

$$\begin{aligned}s_1 &= y + \sigma_i(\mu_i + \eta_i) \\ s_2 &= y + \sigma_i(\mu_i)\end{aligned}\tag{9}$$

where σ_i is a parameter which describes the quality of the signal and:

$$\mu_i \sim N(0, 1)$$

$$\eta_i \sim \begin{cases} 1 & \text{with probability } \frac{1}{2} \\ -1 & \text{with probability } \frac{1}{2} \end{cases}$$

For still more simplicity assume that there are only two types of advisors – some with $\sigma_i = 1$ and the rest with $\sigma_i = \sigma > 1$.

In the second period, the optimal forecast of y is s_2 . There is no reason why the able advisor would not frankly state his new prediction. The less able forecasters, however, will not state this prediction. If they did, the absolute value of their change in predictions, $(f_2 - f_1) = (s_2 - s_1) = -\sigma_i\eta_i$ would be equal to $\sigma_i > 1$. The client would know that the advisor received poor signals, since an able advisor would never change a prediction by more than 1 in either direction. The less able advisors rationally choose to adjust their predictions up 1 if $s_2 > s_1$ and down 1 if $s_2 < s_1$. Observing only the stated predictions f_1 and f_2 , the client has no way of distinguishing between able and not so able advisors.

When y is revealed, the client has some information on the quality of advice, but not enough to catch incompetence with certainty. This makes the dishonest strategy optimal.

To see why this leads to extrapolative expectations, consider a client who attaches probability p to the possibility that his advisor is not able. This probability could be the proportion of not so able advisors or could be the posterior probability based on the advisor's past record. When the advisor adjusts his forecast up by 1, the client considers that with probability $(1 - p)$ the advisor is

able and now giving the best forecast of y . He considers that with probability p the advisor should have adjusted the forecast by σ_i . This means that the expected value of y given the two stated predictions is:

$$\begin{aligned} e(y|f_1, f_2) &= (1-d)f_2 + p[f_1 + \sigma(f_2 - f_1)] \\ &= (1-d)f_2 + p[f_2 + (\sigma - 1)(f_2 - f_1)] \\ &= f_2 + p(\sigma - 1)(f_2 - f_1) \end{aligned} \tag{10}$$

Since $p > 0$ and $\sigma > 1$, expression (10) says that the client rationally extrapolates trends in forecasts as asserted.

This model is very simple, suspiciously simple. In particular, it is important that the not so able advisor will give himself away with certainty if he is frank. Similarly, it is important that the able advisors always adjust their forecasts by the same amount. This means that an able advisor who refuses to admit that he was wrong can gain nothing.

Finally, since able advisors are frank, it is possible that all clients end up with able advisors and forget about the need to extrapolate trends in the forecasts of advisors of dubious ability. This follows from the choice of only two classes of advisors. The able advisor cannot convince their clients that they are more able than they are, so they have no incentive for deceit. In a model with a continuum of advisors, it may be true that no advisor has an incentive to be frank.

Note two further issues. First, we assume that the client only has access to the forecast supplied by his advisor and eventual outcome y . If a claim on y is a traded asset, the client might also observe the market price of the claim on y . The client might also observe published forecasts of other advisors. This raises the issues addressed by Scharfstein and Stein [1990], Froot, Scharfstein and Stein [1990], and Bannerjee [1989]. Second, we have assumed that the variance of $(s_1 - y)$ is proportional to the variance $(s_2 - y)$. If the variance of $(s_1 - y)$ is the same for all advisors and the variance of $(s_2 - y)$ differs, then changing one's forecast is a sign that s_2 is a good signal. This clearly changes everything.

4 Empirical Test

To test the implication of the model of advice, data is necessary in which traceable forecasters predict several times the value of some economic variable for the same target period. One source of such data is the North Holland *Economic Forecast* publication. This monthly newsletter publishes forecasts from a panel of experts of key economic variables for industrialized countries.

The prediction variable used for this work is the forecast of the annualized discount rate on new issues of 91-day US-Treasury Bills, based on weekly auction average rates. This variable has been chosen because the panel for the U.S. is the richest and because interest rate forecasts predict a quoted price which excludes some ambiguities that could arise when predicting national accounting data.

The panel of experts submits prediction of the interest rate on a monthly basis for the quarters of the calendar year. The forecast data have consequently been split in three, small homogeneous panels of first month, second month, and third month forecasts respectively. For the empirical test, only forecasts of those panel participants who reported at least 15 times over the sample period from January 1985 to June 1990 have been included. The cross-section dimension of the data is $N = 23$. The times-series dimension is $T = 22$. The average number of non-missing observations per participant is 18. The corresponding realization data come from the *Federal Reserve Bulletin*. Quarterly discount rates are calculated as the simple average of the monthly data which, in turn, come from the average weekly auction rates already quoted on the annualized discount basis.

For the regression analysis, the data have been stacked across agents per period and along time:

$$\mathbf{Y} = \mathbf{X}\boldsymbol{\beta} + \mathbf{u} \quad (11)$$

where \mathbf{Y} is the $TN \times 1$ -stack of second period forecast errors, \mathbf{X} is the $TN \times 2$ -stack of constant terms and changes in predictions from the first period to the second period, $\boldsymbol{\beta}$ is the 2×1 vector of regression coefficients, and \mathbf{u} is the $TN \times 1$ -stack of disturbance terms.

When running such regressions, care needs to be taken for possible correlation between forecast errors because forecasters are likely to be surprised by

the same aggregate shocks. Ignoring this potential correlation would lead to uncorrectly low standard errors and thus overrejection of the null hypothesis.

More precisely, we assumed:

$$E(u_{i,t}^2) = \sigma_i^2 \text{ for all } t=1 \dots T ; i=1 \dots N \quad (12)$$

$$E(u_{i,t}u_{j,s}) = \begin{cases} \rho\sigma_i\sigma_j & \text{for all } t=s \text{ and } i \neq j \\ 0 & \text{otherwise} \end{cases} \quad (13)$$

This specification allows for heteroscedasticity of the disturbances across units and for non-zero contemporaneous correlation between the disturbances in different units, but excludes (time) serial correlation. The common correlation coefficient ρ reflects the assumption of an aggregate surprise.

The resulting $TN \times TN$ -matrix of disturbances is block-diagonal:

$$\Omega = \begin{pmatrix} \Psi & 0 & \dots & \dots & 0 \\ 0 & \Psi & 0 & \dots & \vdots \\ \vdots & 0 & \ddots & \ddots & \vdots \\ \vdots & \dots & \ddots & \ddots & 0 \\ 0 & \dots & \dots & 0 & \Psi \end{pmatrix} \quad (14)$$

where:

$$\Psi = \begin{pmatrix} \sigma_1^2 & \rho\sigma_1\sigma_2 & \dots & \rho\sigma_1\sigma_N \\ \rho\sigma_2\sigma_1 & \sigma_2^2 & \dots & \vdots \\ \vdots & \ddots & \ddots & \vdots \\ \rho\sigma_N\sigma_1 & \dots & \dots & \sigma_N^2 \end{pmatrix}$$

Individual OLS regressions can be run for each forecaster separately to obtain residual series \mathbf{e}_i . These residuals series are used to estimate the elements of Ω as follows:

$$\hat{\sigma}_i = \sqrt{\frac{\mathbf{e}_i' \mathbf{e}_i}{(T-2)}} \quad (15)$$

and:

$$\hat{\rho} = \frac{\sum_{i \neq j} \rho_{ij}(N_{ij} - 1)}{\sum_{i \neq j} (N_{ij} - 1)} \quad (16)$$

where N_{ij} is the number of observations with non-missing forecasts for both forecasters i and j , and ρ_{ij} is the correlation coefficient for any pair of forecasters (i, j) .

Using $\hat{\Omega}$, we can run the regression of the stacked data in equation (11) to obtain an estimate of β and correct the estimated standard errors of the coefficient estimates as follows:

$$\text{cov}_{\hat{\beta}} = (\mathbf{X}'\mathbf{X})^{-1}\mathbf{X}'\hat{\Omega}\mathbf{X}(\mathbf{X}'\mathbf{X})^{-1} \quad (17)$$

The results of the three regressions using the changes from the first month to the third month, the first month to the second, and the second to the third as regressors are summarized in Table 1. In all three regressions, the estimated coefficients have the wrong sign, and significantly so. Forecasters in this particular sample do not choose a weight in order to trick clients into believing in superior information. To the contrary, the advisors in this panel put too much weight on their new forecast. Correcting for that bias would improve their forecast.

Table 1

Testing for Advisor's Honesty*

Dependent Variable: (Forecast_{*i*} - Outcome)

Regression	Constant	Change in Forecast	
1. Change 3rd-1st	-0.006 (-0.523)	0.127 (4.470)	N=384 $R^2=0.08$
2. Change 2nd-1st	-0.022 (-1.050)	0.230 (4.845)	N=396 $R^2=0.095$
3. Change 3rd-2nd	-0.004 (-0.414)	0.236 (6.134)	N=385 $R^2=0.15$

* OLS regressions with corrected standard errors. t-statistics in parentheses.

5 Conclusion

This paper proposes an advising game between optimizing experts and rational clients. The advisor provides the client with forecasts about the future value of a random variable. While doing so, he is concerned about his reputation and tries to make the client believe in the quality of his advice. The client on the other hand attempts to infer about the quality of advice.

When adjusting for potential bias in the advice, optimal behavior of the clients results in extrapolation of past trends - an observed phenomenon economists remain puzzled over. The main implication of the model, that advisor fearful of their reputation under-adjust their stated old predictions, has been tested with a small panel data set of expert forecasts. The hypothesis is rejected. Coefficients have significantly wrong signs.

This result also rejects the rational expectations hypothesis with a quadratic loss function. Furthermore the failure of our effort to explain systematic forecast errors with an optimizing model supports the view that this rejection is meaningful and not just the result our misunderstanding of the problem which agents were attempting to solve. Needless to say, one such failure does not imply that a more sophisticated model of the advising game could not reconcile our empirical results with the rational expectations hypothesis.

References

- [1] Alpert, M. and H. Raiffa, (1959), "A Progress Report on the Training of Probability Assessors," in Kahneman, D.; P. Slovic; and A. Tversky, eds. (1982), *Judgment Under Uncertainty: Heuristics and Biases*, Cambridge, UK: Cambridge University Press.
- [2] Andreassen, P. and S. Kraus, (1987), "Intuitive Prediction by Extrapolation: The Stock Market, Exponential Growth, Divorce, and the Salience of Change," *Harvard University mimeo*.
- [3] Bannerjee, A. V., (1992), "A Simple Model of Herd Behavior," *Quarterly Journal Of Economics*, CVII(3), pp. 797-817.
- [4] Benabou, R. and G. Laroque, (1992), "Using Privileged Information to Manipulate Markets: Insiders, Gurus, and Credibility," *Quarterly Journal of Economics*, CVII(3), pp. 922-958.

- [5] Carlson, J. A., (1977), "A Study of Price Forecasts," *Annals of Economic and Social Measurement*, 6, 27-56.
- [6] Case, K. and R. Shiller, (1988), "The Behavior of Home Buyers in Boom and Post Boom Markets," *NBER Working Paper 2748*, Cambridge, MA.
- [7] De Long, J. B.; Shleifer, A.; Summers, L. H. and Waldmann, R., (1990), "Positive Feedback Investment Strategies and Destabilizing Rational Speculation," *Journal of Finance*, 65, 379-95.
- [8] *Economic Forecasts: A Worldwide Survey*, Elsevier-North Holland, Essex, Various Issues.
- [9] Ehrbeck, T., (1992), "Rejecting Rational Expectations in Panel Data: Some New Evidence," *European University Institute working paper ECO No. 92/91*.
- [10] Einhorn, H. and R. Hogarth, (1978), "Confidence in Judgment: Persistence of the Illusion of Validity," *Psychological Review*, 85, 395-476.
- [11] Figlewski, S. and P. Wachtel, (1981), "The Formation of Inflationary Expectations," *Review of Economics and Statistics*, 63, 1-10.
- [12] Frankel, J. and K. A. Froot, (1988), "Explaining the Demand for Dollars: International Rates of Return and the Expectations of Chartists and Fundamentalists," in R. Chambers and P. Paarlberg, eds., *Agriculture, Macroeconomics, and the Exchange Rate*, Westfield Press, Boulder, CO, 25-80.
- [13] Froot, K.A.; D.S. Scharfstein and J.C. Stein, (1990), "Herd on the Street," *NBER working paper number 3250*.
- [14] Ito, T. (1990) "Foreign Exchange Rate Expectations: Micro Survey Data," *American Economic Review*, 80, 434-449.
- [15] Kahneman, D.; P. Slovic; and A. Tversky, eds. (1982), *Judgment Under Uncertainty: Heuristics and Biases*, Cambridge, UK: Cambridge University Press.
- [16] Lichtenstein, S.; B. Fischhoff; and L.D. Phillips, (1982), "Calibration of Probabilities: The State of the Art as of 1980," in Kahneman, D.; P. Slovic; and A. Tversky, eds. (1982), *Judgment Under Uncertainty: Heuristics and Biases*, Cambridge, UK: Cambridge University Press.

- [17] Pierce, D. K., (1979), "Comparing Survey and Rational Measures of Inflation," *Journal of Money Credit and Banking*, 11, 447-456.
- [18] Pesando, J. E., (1975), "A Note on The Rationality of the Livingston Price Expectations," *Journal of Political Economy*, 83, 849-858.
- [19] Scharfstein, D. and J. Stein, (1990), "Herd Behavior and Investment," *American Economic Review*, 80, 465-479.
- [20] Smith, V.; G. Suchanek and A. Williams, (1988), "Bubbles, Crashes, and Endogenous Expectations in Experimental Stock Markets," *Econometrica*, 56, 1119-51.
- [21] Tversky, A. and D. Kahneman, (1971), "Belief in the Law of Small Numbers," *Psychological Bulletin*, 2, 105-10.
- [22] Tversky, A. and D. Kahneman, (1974), "Judgment Under Uncertainty: Heuristics and Biases," *Science*, 185, 1124-31.



EUI WORKING PAPERS

EUI Working Papers are published and distributed by the
European University Institute, Florence

Copies can be obtained free of charge
– depending on the availability of stocks – from:

The Publications Officer
European University Institute
Badia Fiesolana
I-50016 San Domenico di Fiesole (FI)
Italy

Please use order form overleaf

Publications of the European University Institute

To The Publications Officer
European University Institute
Badia Fiesolana
I-50016 San Domenico di Fiesole (FI) – Italy
Telefax No: +39/55/573728

From Name

 Address.....

- ☐ Please send me a complete list of EUI Working Papers
- ☐ Please send me a complete list of EUI book publications
- ☐ Please send me the EUI brochure Academic Year 1994/95
- ☐ Please send me the EUI Research Review

Please send me the following EUI Working Paper(s):

No, Author

Title:

No, Author

Title:

No, Author

Title:

No, Author

Title:

Date

Signature



**Working Papers of the Department of Economics
Published since 1993**

ECO No. 93/1

Carlo GRILLENZONI
Forecasting Unstable and Non-Stationary
Time Series

ECO No. 93/2

Carlo GRILLENZONI
Multilinear Models for Nonlinear Time
Series

ECO No. 93/3

Ronald M. HARSTAD/Louis PHILIPS
Futures Market Contracting When You
Don't Know Who the Optimists Are

ECO No. 93/4

Alan KIRMAN/Louis PHILIPS
Empirical Studies of Product Markets

ECO No. 93/5

Grayham E. MIZON
Empirical Analysis of Time Series:
Illustrations with Simulated Data

ECO No. 93/6

Tilman EHRBECK
Optimally Combining Individual
Forecasts From Panel Data

ECO NO. 93/7

Víctor GÓMEZ/Agustín MARAVALL
Initializing the Kalman Filter with
Incompletely Specified Initial Conditions

ECO No. 93/8

Frederic PALOMINO
Informed Speculation: Small Markets
Against Large Markets

ECO NO. 93/9

Stephen MARTIN
Beyond Prices Versus Quantities

ECO No. 93/10

José María LABEAGA/Angel LÓPEZ
A Flexible Demand System and VAT
Simulations from Spanish Microdata

ECO No. 93/11

Maozu LU/Grayham E. MIZON
The Encompassing Principle and
Specification Tests

ECO No. 93/12

Louis PHILIPS/Peter MØLLGAARD
Oil Stocks as a Squeeze Preventing
Mechanism: Is Self-Regulation Possible?

ECO No. 93/13

Pieter HASEKAMP
Disinflation Policy and Credibility: The
Role of Conventions

ECO No. 93/14

Louis PHILIPS
Price Leadership and Conscious
Parallelism: A Survey

ECO No. 93/15

Agustín MARAVALL
Short-Term Analysis of Macroeconomic
Time Series

ECO No. 93/16

Philip Hans FRANCES/Niels
HALDRUP
The Effects of Additive Outliers on Tests
for Unit Roots and Cointegration

ECO No. 93/17

Fabio CANOVA/Jane MARRINAN
Predicting Excess Returns in Financial
Markets

ECO No. 93/18

Iñigo HERGUERA
Exchange Rate Fluctuations, Market
Structure and the Pass-through
Relationship

ECO No. 93/19

Agustín MARAVALL
Use and Misuse of Unobserved
Components in Economic Forecasting

ECO No. 93/20

Torben HOLVAD/Jens Leth
HOUGAARD
Measuring Technical Input Efficiency for
Similar Production Units:
A Survey of the Non-Parametric
Approach

ECO No. 93/21

Stephen MARTIN/Louis PHLIPS
Product Differentiation, Market Structure
and Exchange Rate Passthrough

ECO No 93/22

F. CANOVA/M. FINN/A. R. PAGAN
Evaluating a Real Business Cycle Model

ECO No 93/23

Fabio CANOVA
Statistical Inference in Calibrated Models

ECO No 93/24

Gilles TEYSSIERE
Matching Processes in the Labour Market
in Marseilles. An Econometric Study

ECO No 93/25

Fabio CANOVA
Sources and Propagation of International
Business Cycles: Common Shocks or
Transmission?

ECO No. 93/26

Marco BECHT/Carlos RAMÍREZ
Financial Capitalism in Pre-World War I
Germany: The Role of the Universal
Banks in the Financing of German
Mining Companies 1906-1912

ECO No. 93/27

Isabelle MARET
Two Parametric Models of Demand,
Structure of Market Demand from
Heterogeneity

ECO No. 93/28

Stephen MARTIN
Vertical Product Differentiation, Intra-
industry Trade, and Infant Industry
Protection

ECO No. 93/29

J. Humberto LOPEZ
Testing for Unit Roots with the k-th
Autocorrelation Coefficient

ECO No. 93/30

Paola VALBONESI
Modelling Interactions Between State and
Private Sector in a "Previously" Centrally
Planned Economy

ECO No. 93/31

Enrique ALBEROLA ILA/J. Humberto
LOPEZ/Vicente ORTOS RIOS
An Application of the Kalman Filter to
the Spanish Experience in a Target Zone
(1989-92)

ECO No. 93/32

Fabio CANOVA/Morten O. RAVN
International Consumption Risk Sharing

ECO No. 93/33

Morten Overgaard RAVN
International Business Cycles: How
much can Standard Theory Account for?

ECO No. 93/34

Agustín MARAVALL
Unobserved Components in Economic
Time Series

ECO No. 93/35

Sheila MARNIE/John
MICKLEWRIGHT
"Poverty in Pre-Reform Uzbekistan:
What do Official Data Really Reveal?"

ECO No. 93/36

Torben HOLVAD/Jens Leth
HOUGAARD
Measuring Technical Input Efficiency for
Similar Production Units:
80 Danish Hospitals

ECO No. 93/37

Grayham E. MIZON
A Simple Message for Autocorrelation
Correctors: DON'T

ECO No. 93/38

Barbara BOEHNLEIN
The Impact of Product Differentiation on
Collusive Equilibria and Multimarket
Contact

ECO No. 93/39

H. Peter MØLLGAARD
Bargaining and Efficiency in a Speculat-
ive Forward Market

ECO No. 94/1

Robert WALDMANN

Cooperatives With Privately Optimal
Price Indexed Debt Increase Membership
When Demand Increases

ECO No. 94/2

**Tilman EHRBECK/Robert
WALDMANN**

Can Forecasters' Motives Explain Rejection
of the Rational Expectations Hypothesis?

